

# **Joule 기반 Fullstack 실전 앱 개발**

**BTP services : Build Code, Work Zone, HANA Cloud**

한정우

BTP Solution Advisory



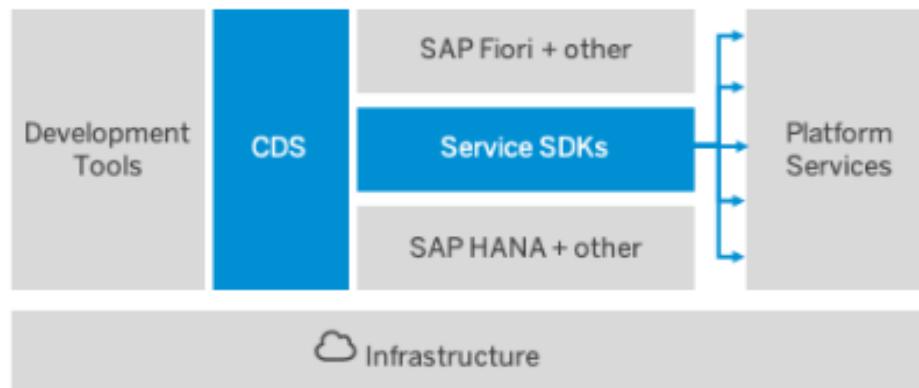
# About CAP

[Introducing the Cloud Application Programming Model \(CAP\)](https://cap.cloud.sap/docs/about/)

June 5 2018



Daniel Hutzel

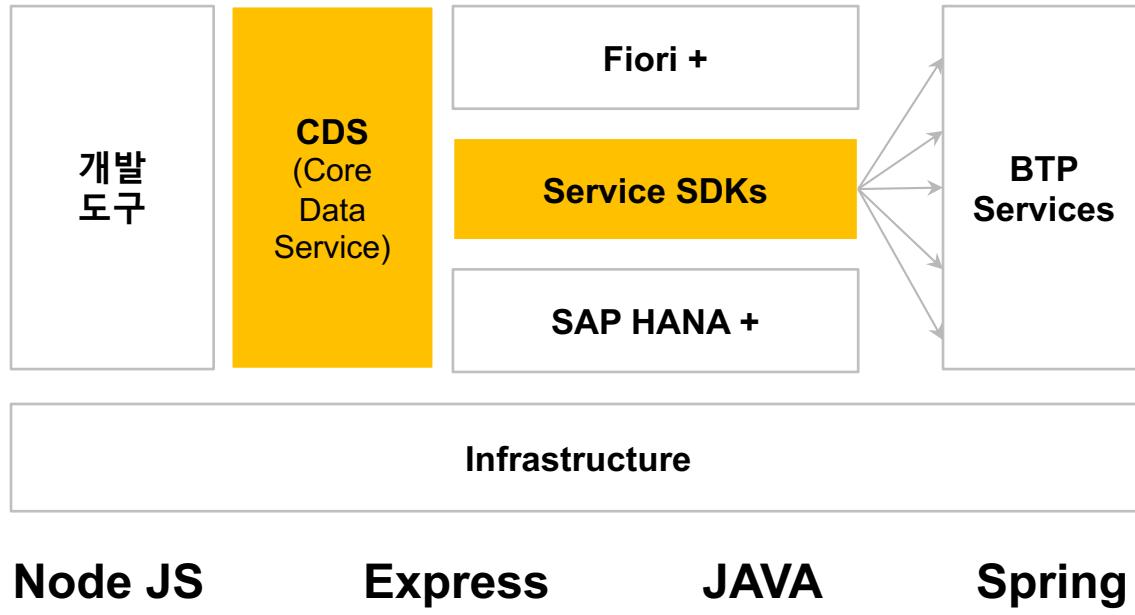


<https://cap.cloud.sap/docs/about/>

The *SAP Cloud Application Programming Model (CAP)* is a framework of **languages**, **libraries**, and **tools** for building enterprise-grade services and applications. It guides developers along a 'golden path' of proven **best practices** and a great wealth of **out-of-the-box solutions** to recurring tasks.

CAP-based projects benefit from a primary focus on domain. Instead of delving into overly technical disciplines, we focus on accelerated development and safeguarding investments in a world of rapidly changing cloud technologies.

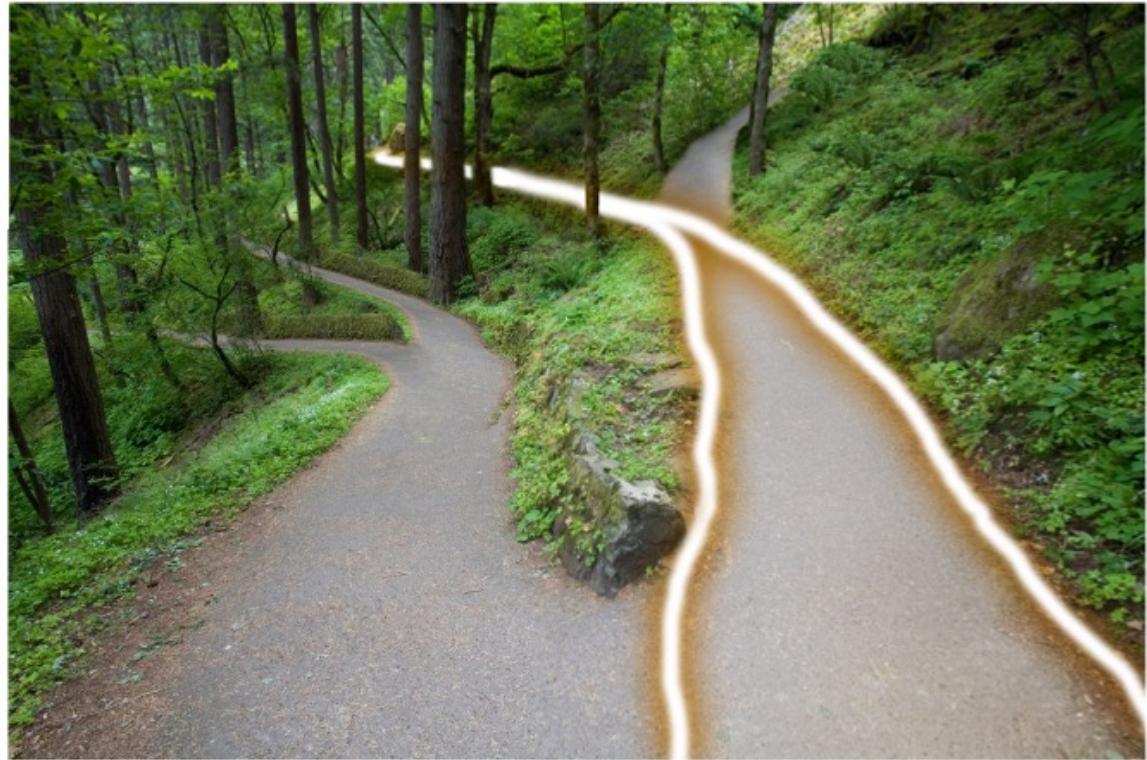
# BTP의 Cloud Application Programming 프레임워크



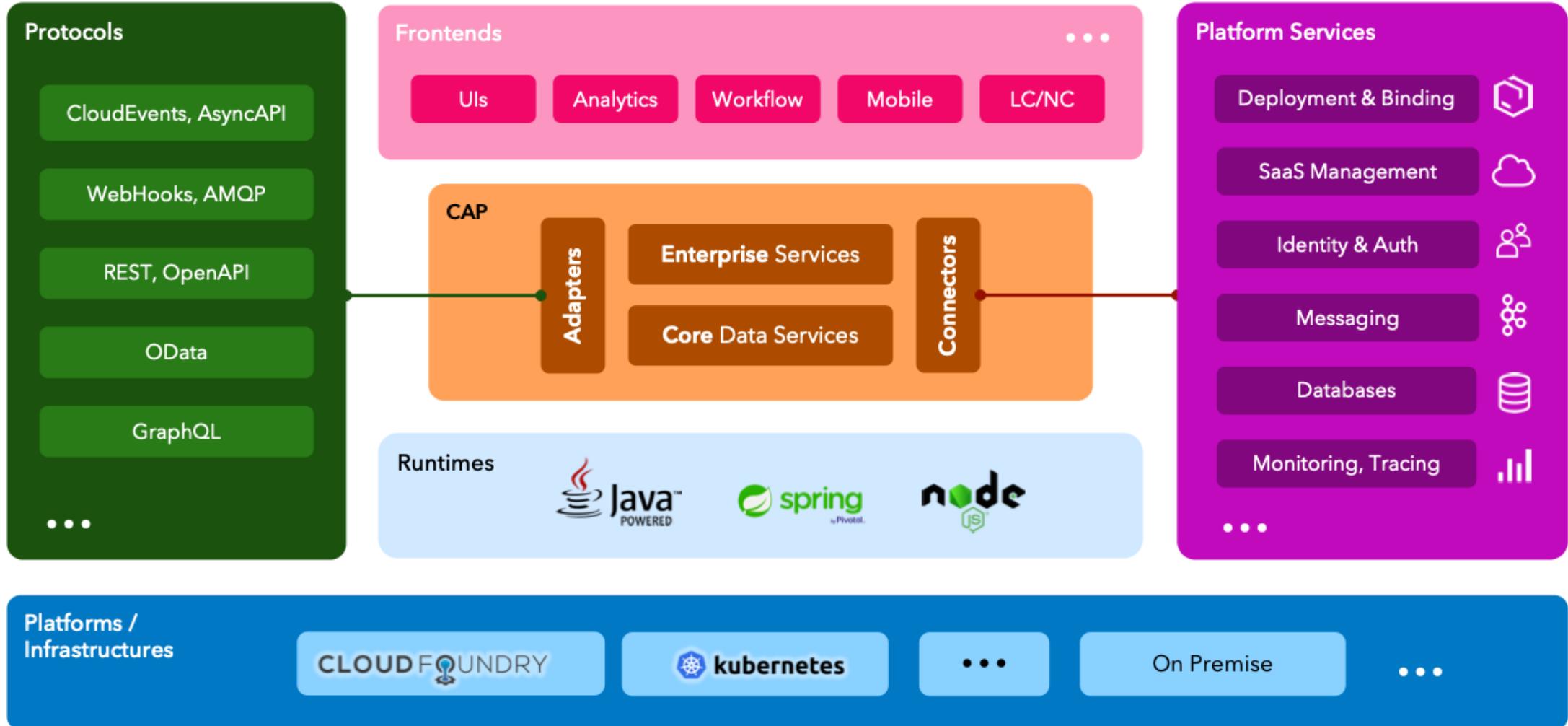
- Lock In 없는 **Agnostic** 디자인
- **Opinionated Guidance, but Open**
- **CDS**에 기반한 **Biz Domain** 중심의 모델링
- 검증된 **Best Practices, Served Out of the Box** (Request 처리, 반복 Tasks 등)
- **SQL기반 Dynamic Querying & Views** (Core Query Language, Queries as first order Objects 등)
- **Service와 이벤트** 중심
- **Jumpstart & Grow as you go**

## BTP 개발 프레임워크 – CAP > makes the golden path.

- Set of best practices, conventions, and guidelines that developers are encouraged to follow to achieve successful outcomes with reduced complexities.
- providing a "paved road" that leads to optimal results, reducing the complexity and decision-making burden for developers.
- promote an open architecture with minimal but well-documented technology choices



# BTP 개발 프레임워크 – CAP > 특징

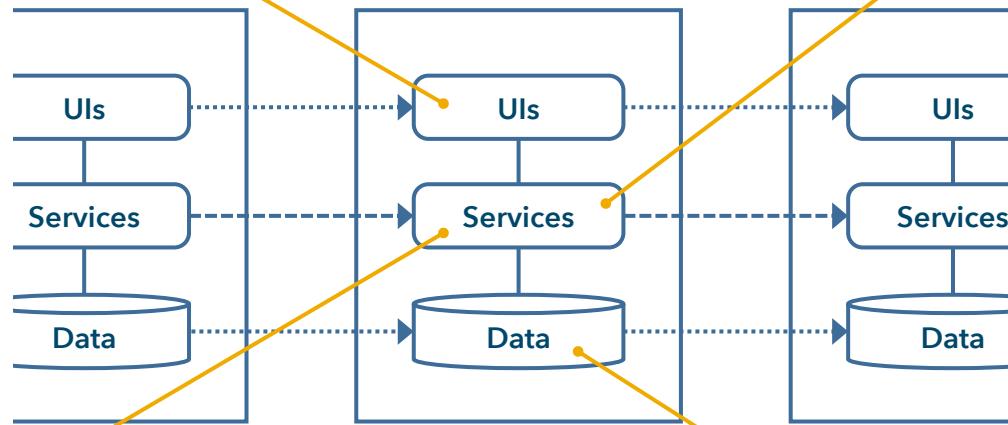


# BTP 개발 프레임워크 – CAP > 특징



## Fiori UIs를 위한 API제공

- OData v2 + v4
- Draft 기능 지원
- \$batch support, ...



## Services 제공

- CDS를 활용한 서비스 정의
- Service Providers 역할 수행
- Custom 개발 영역 (Event Handlers → generic + custom)
- 서비스간 이벤트 호출 (Emitting Events)

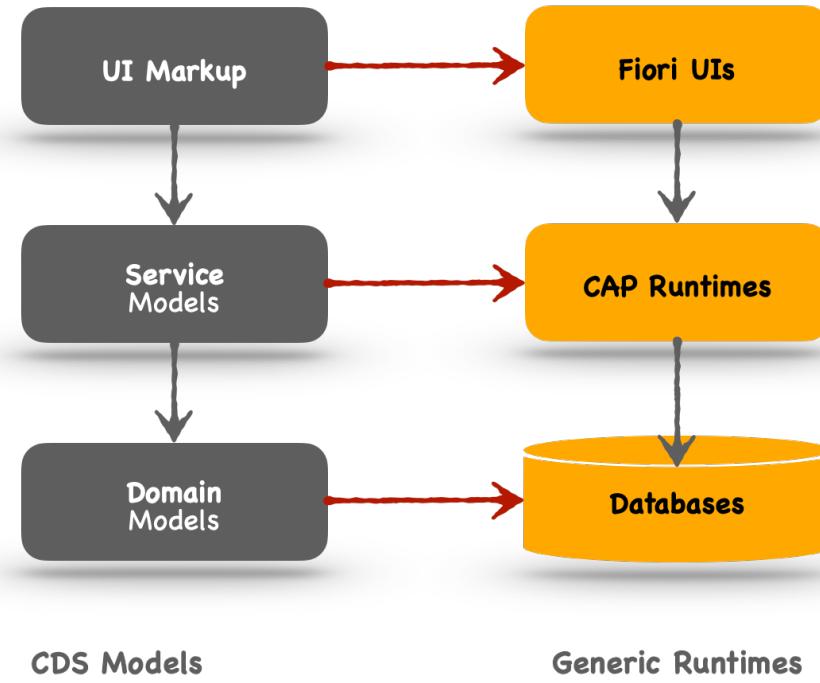
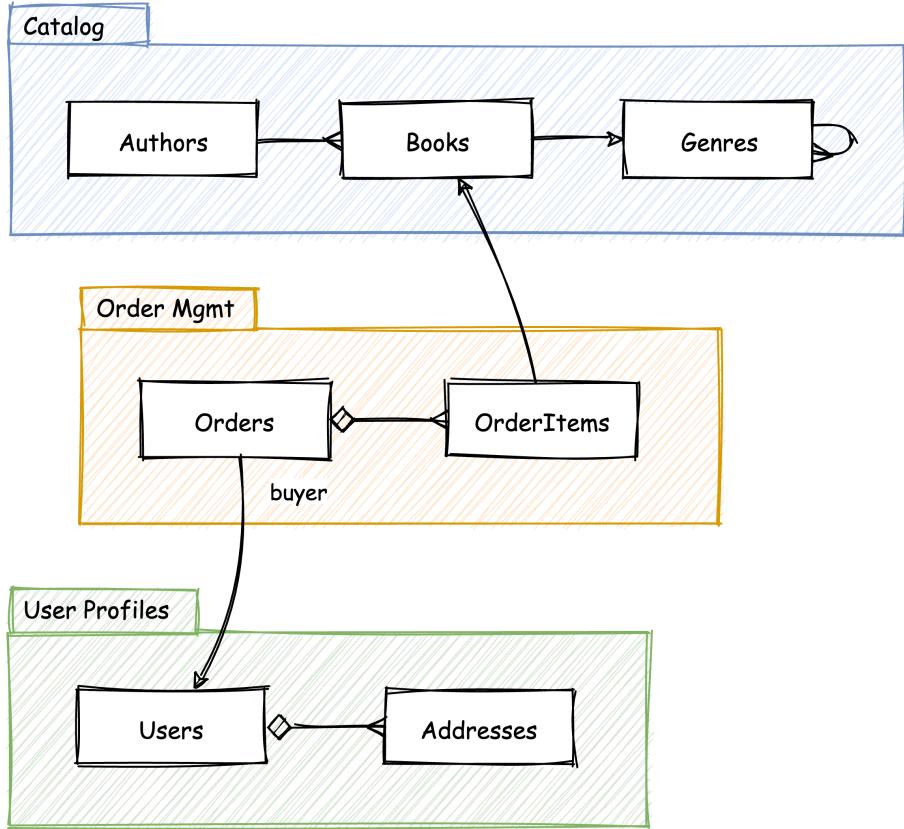
## 외부 Services 활용

- 외부 OData스펙(edmx) 정보를 기반으로 서비스 정의
- 로컬서비스와 외부서비스간의 Mash-ups
- Service Client APIs 자동 생성

## 데이터베이스 지원(Runtime시 Database artifact 생성)

- Out-of-the-box: HANA, SQLite
- Dynamic Data Access layers 지원(cds.ql)

# 생산적인 Cloud native 어플리케이션?



- 고객 side : 도메인 모델링 정의 & 개발에 집중.
- Low-level tech(boilerplate) 는 SAP CAP에서 자동 프로그램 지원 .

- DB artifacts(table, view...). Enterprise-ready support(International – 다국어, currency,...)
- Service artifacts(OData API). Security(Authority) management.
- User Interface(Fiori-element) Annotation.

# 생산적인 Cloud native 어플리케이션?

## Conceptual Modelling Language

- Entities & Views → SQL 기반
- Associations → 관계 표현
- Aspects → 공통 영역 정의 및 확장
- Annotations → semantically 다양한 의미로 해석

## Core Schema Notation (CSN) 기능

## Generic Runtimes 과 자연스러운 연계

⇒ Domain-Driven Design:

developers 과 domain experts 간 밀접한 협업 가능.

The screenshot shows the SAP Studio IDE interface. On the left, there is a tree view of files: 'schema.cds' and 'cat-service.cds'. The main area displays two code snippets. The top snippet, 'schema.cds', defines entities for Books, Authors, and Genres. The Books entity has attributes ID (key), title, descr, author (Association to Authors), and genre (Association to Genres). The Authors entity has attributes ID (key), name, and books (Association to many Books on books.author = \$self). The Genres entity is a sap.common.CodeList with attributes ID (key), parent (Association to Genres), and children (Composition of many Genres on children.parent = \$self). The bottom snippet, 'cat-service.cds', defines a service CatalogService with a Catalog endpoint. This endpoint uses a Books entity with attributes SELECT from my.Books (\*, author.name as author) and excludes createdBy and modifiedBy. It also includes a submitOrder action with parameters book (Books.ID) and amount (Integer). The code is annotated with SAP-specific keywords like managed, sap, and @requires\_. The interface includes standard file operations (New, Open, Save, etc.) and a status bar at the bottom.

```
using { Currency, managed, sap } from '@sap/cds/common';
namespace sap.capire.bookshop;

entity Books : managed {
    key ID : Integer;
    title : localized String(111);
    descr : localized String(1111);
    author : Association to Authors;
    genre : Association to Genres;
}

entity Authors : managed {
    key ID : Integer;
    name : String(111);
    books : Association to many Books on books.author = $self;
}

entity Genres : sap.common.CodeList {
    key ID : Integer;
    parent : Association to Genres;
    children : Composition of many Genres on children.parent = $self;
}

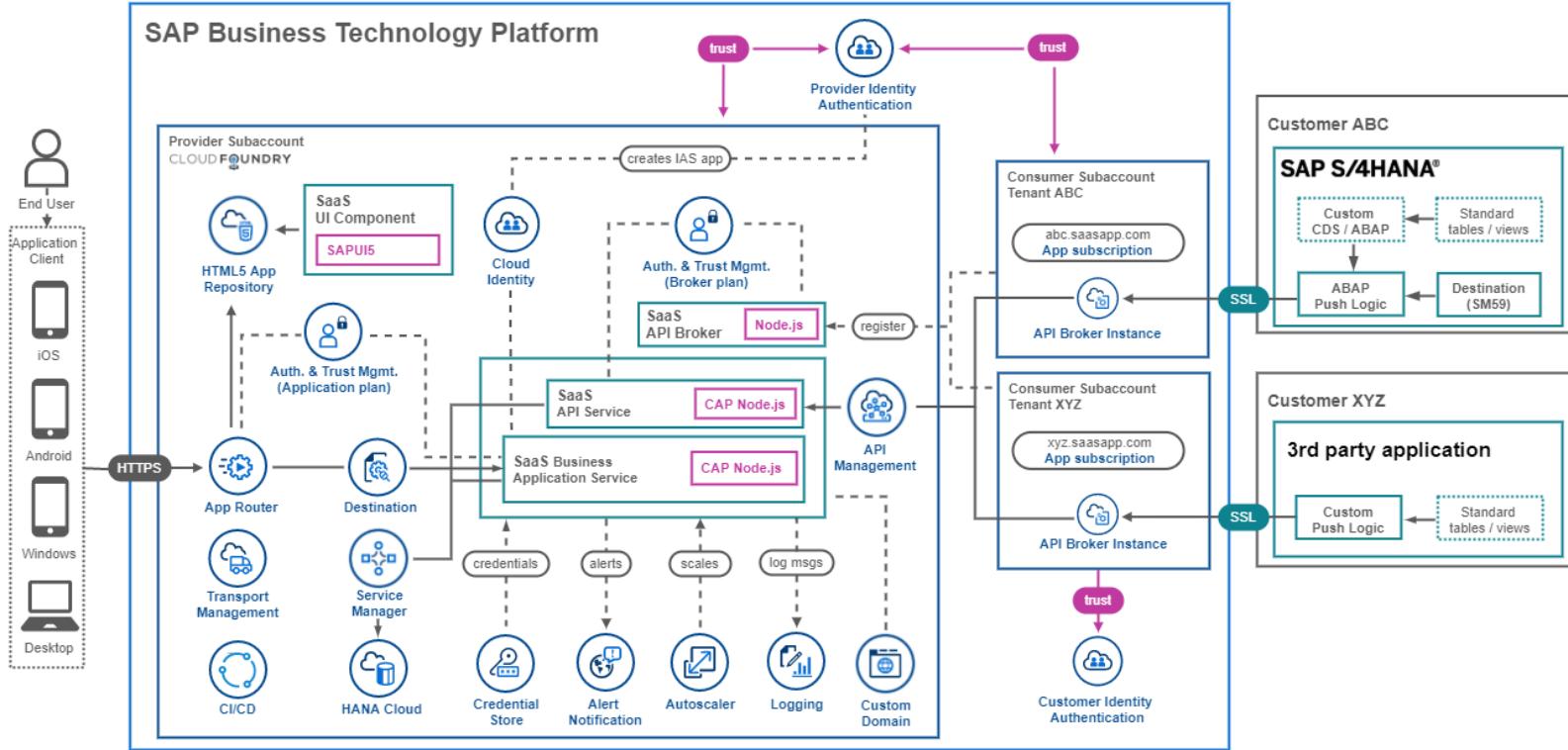
using { sap.capire.bookshop as my } from '../db/schema';
service CatalogService @({path: '/browse'}) {

    @readonly entity Books as SELECT from my.Books {*, author.name as author} excluding { createdBy, modifiedBy };

    @requires_ 'authenticated-user'
    action submitOrder (book : Books.ID, amount: Integer);
}
```

# 효율적인 Cloud native 어플리케이션?

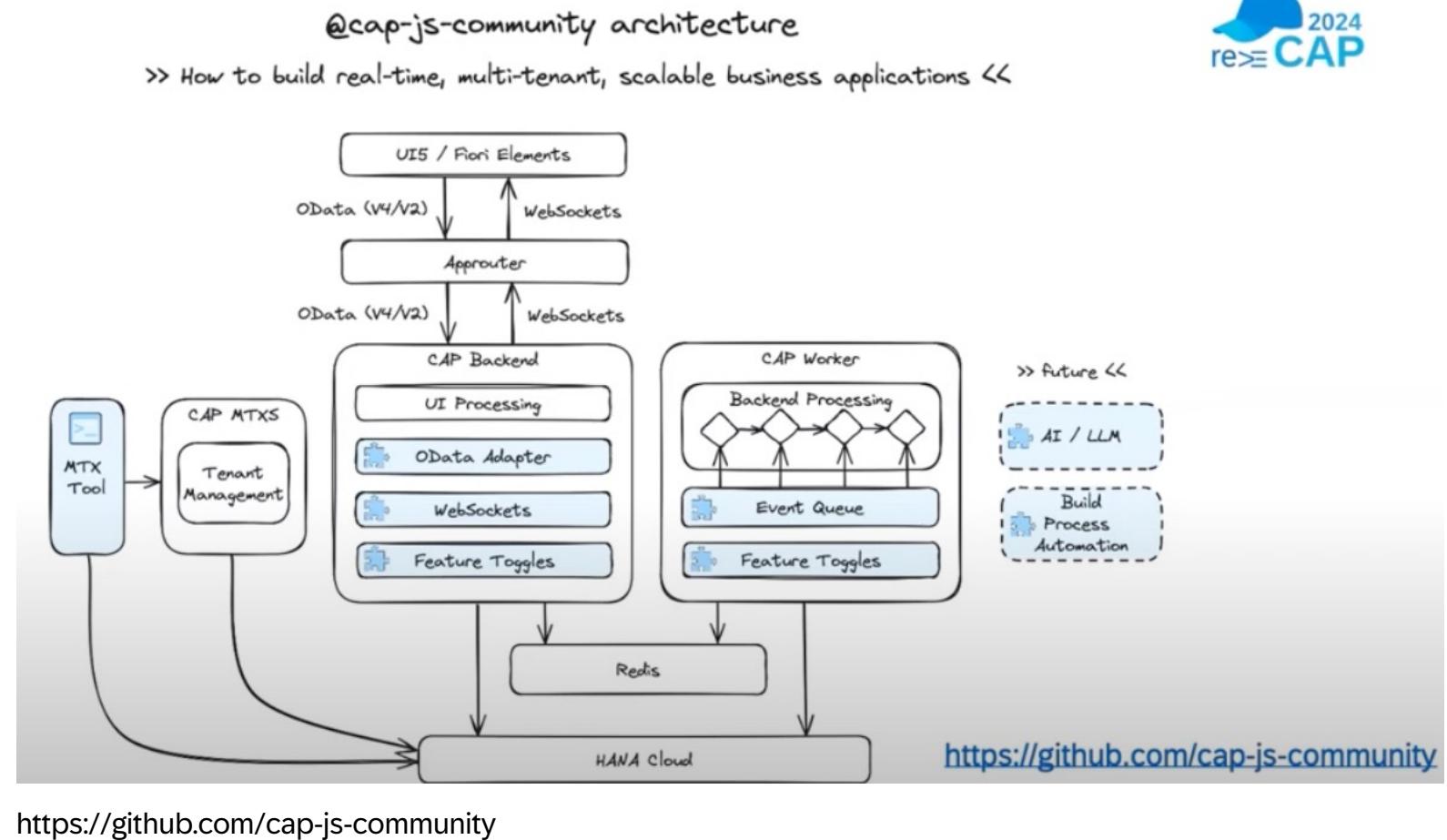
Multi-tenancy application(SaaS) 구현 프레임워크 제공



- SAP BTP는 Business PaaS 플랫폼으로, Single tenant 및 Multitenancy 형태의 App개발을 위한 유연한 플랫폼 제공
- SaaS App개발 서비스를 위한 무료 기본 컴포넌트 제공.
- Container화된 multitenancy DB 영역 지원
- 오픈 소스 기반 BTP CAP framework 무료 제공
- 각 Client만의 전용 Subaccount가 제공되며, SSO 와 ERP포함 legacy와의 안전한 연계 지원

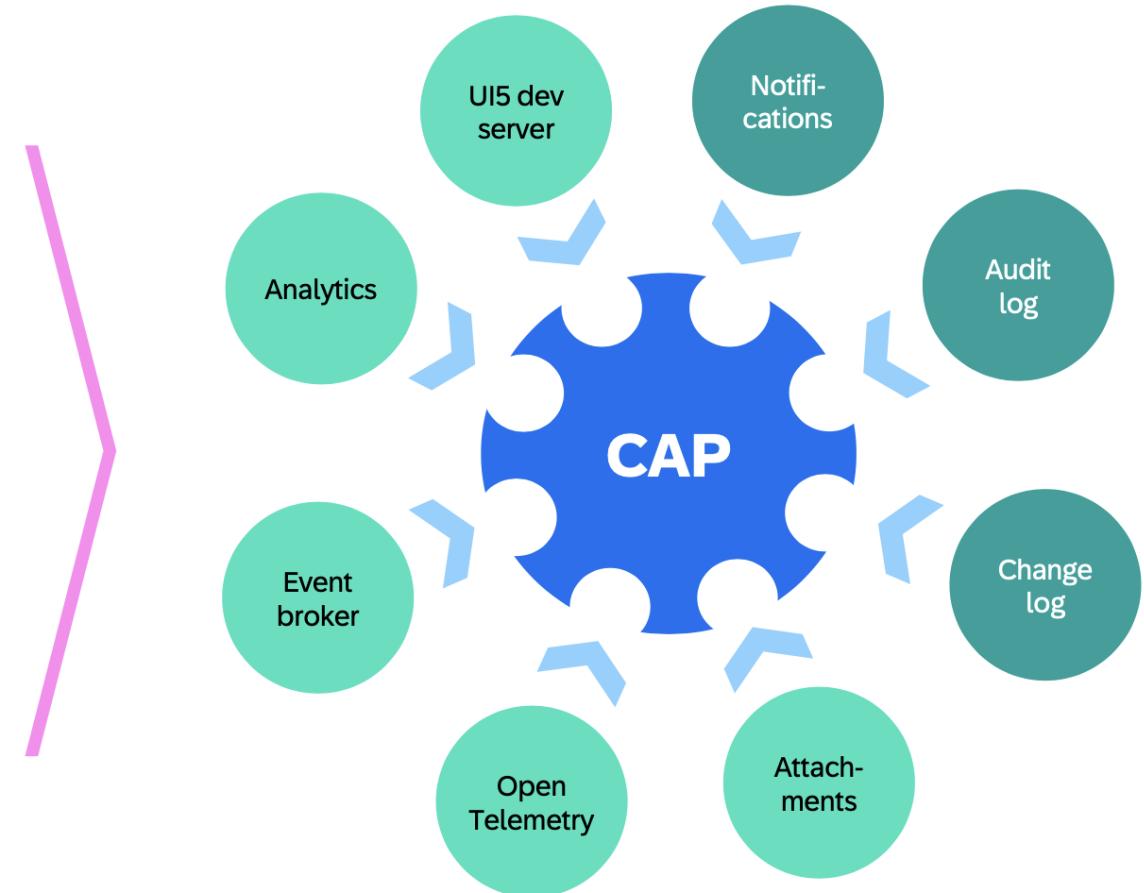
# CAP based AFC Program goes open-source

- 3000 명 이상의 Active Users
- 300개 테넌트
- 90개 feature toggles
- 2M events/month
- 100k WebSocket events/month



# Build Code demo – Joule Copilot + CAP Plugins

- Consumption of existing service integrations and functionality is easier
- Plugin is developed once and reused many times
- Efforts on upgrade and maintenance are centralized with the plugin
- Best practices can be readily followed



## Hands-on steps

- Step 1 - CAP 기본 모델 생성 by Joule
- Step 2 - CAP Plugins 기능 적용
- Step 3 - Custom logic 추가 by Joule
- Step 4 - Fiori UI application 생성 및 Work Zone 구성
  - 배포 및 Work Zone구성은 Speaker only
- Step 5 – Consume Remote API(S/4HANA)
  - Mash-up CAP entity & remote entity

# **Step #1 : CAP 기본 모델 생성**

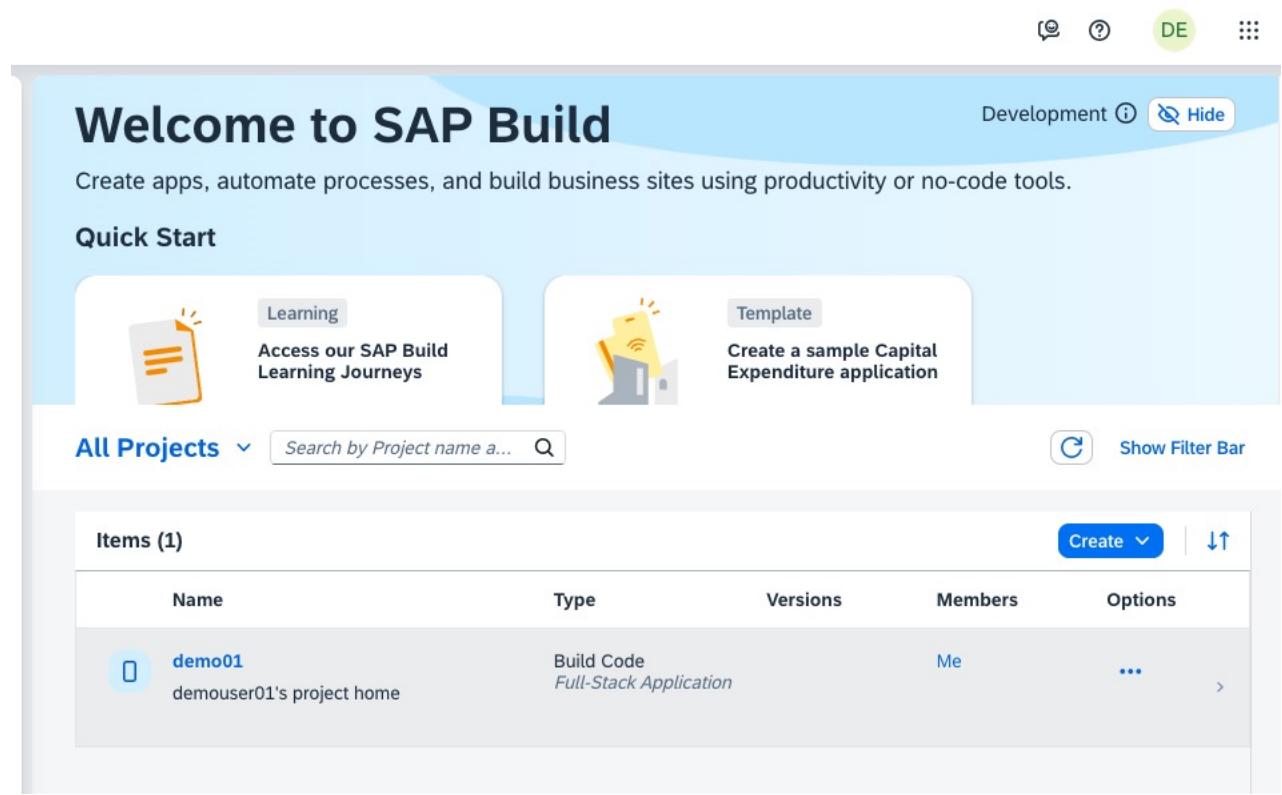
# Open Build Code workspace

Build Code link:

<https://8xsghdn-bw0zhxp.us10.build.cloud.sap/lobby>



The screenshot shows the SAP Sign In page for the Build Code workspace. It features a SAP logo at the top left. The main heading is "Sign In" with a subtitle "SAP BTP subaccount BTPKRMTA-Dev\_buildcode\_handson". Below this, there is a large dashed box containing the "Mapping ID" login section. Inside the box, there is an "Email or User Name or Phone" input field containing "demouser01@bestrun.com", a "Password" input field with a visible password ".....", and two buttons: "Keep me signed in" and "Forgot password?". At the bottom right of the box is a "Continue" button.



The screenshot shows the "Welcome to SAP Build" interface. At the top, it says "Welcome to SAP Build" and "Development ⚙ Hide". Below this, there is a "Quick Start" section with two cards: "Learning" (Access our SAP Build Learning Journeys) and "Template" (Create a sample Capital Expenditure application). The main area is titled "All Projects" with a search bar "Search by Project name a...". A table titled "Items (1)" lists one item: "demo01" (Type: Build Code, Full-Stack Application, Versions: Me, Options: three dots). There are also "Create" and "Show Filter Bar" buttons.

# Create a project

The screenshot shows the SAP Build interface. At the top, there's a navigation bar with icons for SAP BTP Cockpit, Dev Space Manager (highlighted with a red arrow), Roadmap, Learning Journeys, Missions, and Explore SAP Build. Below this is a main content area titled "Welcome to SAP Build" with sections for "Quick Start" (Learning Journeys) and "All Projects". A search bar and a "Show Filter Bar" button are also present. The "All Projects" section shows 8 items, with one named "incidentapp07" selected. The title bar of the browser window says "SAP Business Application Studio".

!!! Click Dev Space Manager !!!

!!! Check status and Click “Full\_Stack” !!!

| Name       | Status  | Created On          | ID       | Disk Usage        | Action |
|------------|---------|---------------------|----------|-------------------|--------|
| fs5        | STOPPED | 10/28/2024 10:54 AM | ws-hzqnf | 174.7 MB / 9.7 GB |        |
| Full_Stack | RUNNING | 10/08/2024 10:46 AM | ws-hbxvf | 1.4 GB / 9.7 GB   |        |

# Create a project

Full-Stack Project Details

Basic project information

Project name \*

Description

Namespace

Service name



Storyboard 확인.

Storyboard - mybcproject01

External Resources +

Data Models +

Services +

UI Applications +

Add a new external resource.

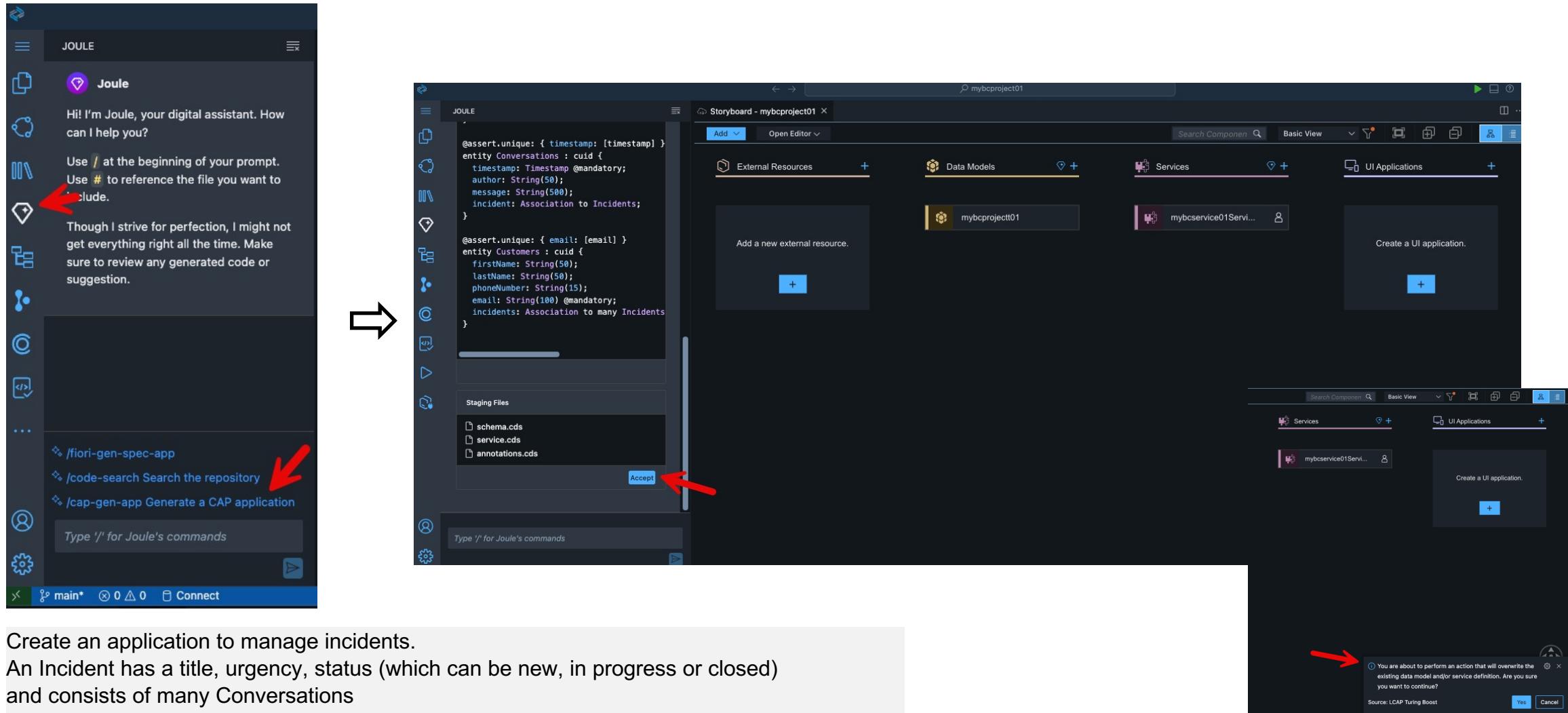
mybcproject01

mybcservice01Serv...

Create a UI application.

입력 : Project name, Namespace, Service name

# CAP Domain modeling (“/cap-gen-app” + description)



Create an application to manage incidents.

An Incident has a title, urgency, status (which can be new, in progress or closed) and consists of many Conversations

A conversation has a timestamp, an author and a message. Incidents are linked to customer.

A customer has a first name, last name, phone number, email(unique identifier).

Warning => Yes

# CAP Sample data (“/cap-gen-data” + description)

The screenshot shows the SAP Joule interface with three main panes:

- Left Pane:** Shows CDS code for the `JOULE` service, defining entities like `Customers` and `Incidents`. It also displays a message about generating sample data.
- Middle Pane:** Shows the generated sample data for the `Incidents` entity. The data is listed in a table with columns: `ID*`, `title`, `urgency`, and `status`. A green box highlights the `status` column, which has three values: `new`, `in progress`, and `closed`.
- Right Pane:** Shows the `service.cds` file and the `Data Editor` tab, where the sample data is being viewed.

A red arrow points from the message in the left pane to the generated sample data in the middle pane.

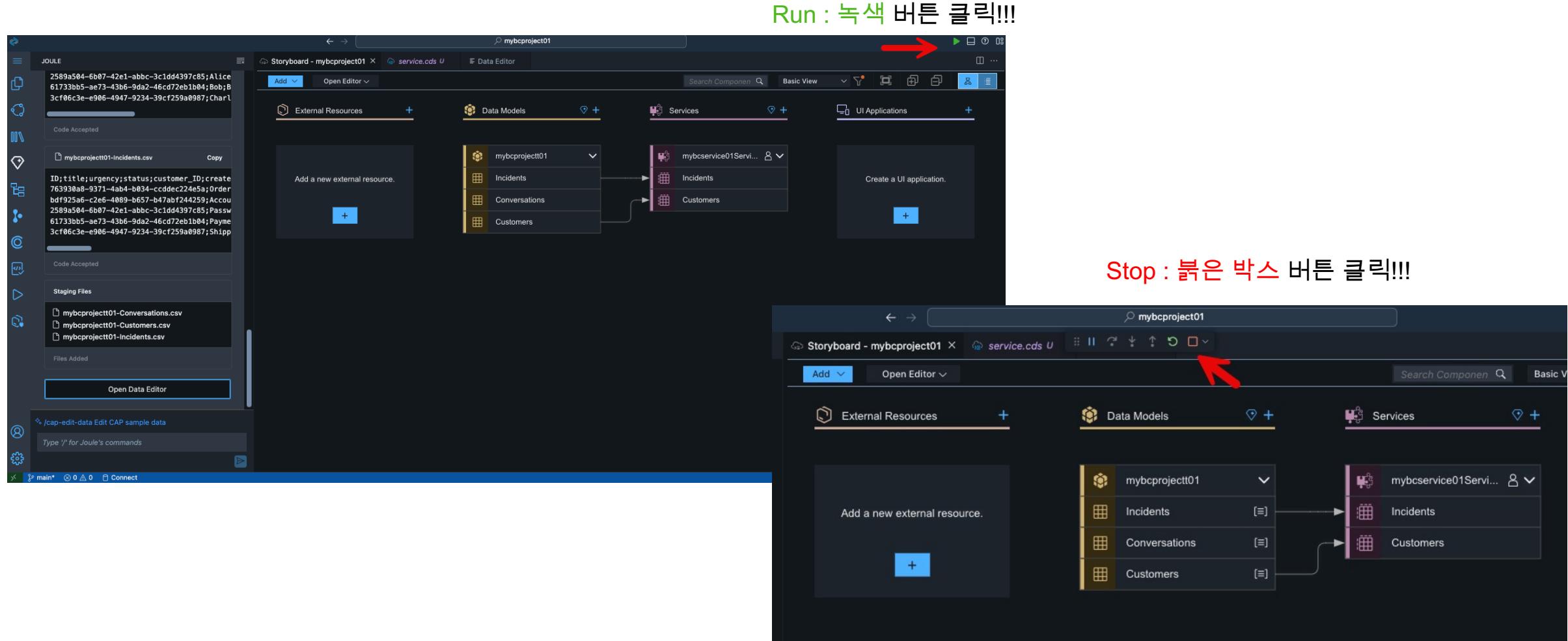
| ID* | title                 | urgency | status      |
|-----|-----------------------|---------|-------------|
| 1   | Order Not Delivered   | High    | new         |
| 2   | Account Access Iss... | Medium  | in progress |
| 3   | Password Reset Re...  | Low     | closed      |
| 4   | Payment Failure       | High    | new         |
| 5   | Shipping Delay        | Medium  | in progress |

## “/cap-gen-data” + description

I would like to generate 10 rows of sample data.

The column status of Incident entity has 3 values ( new, in progress or closed)

# Fiori Preview



# Fiori preview

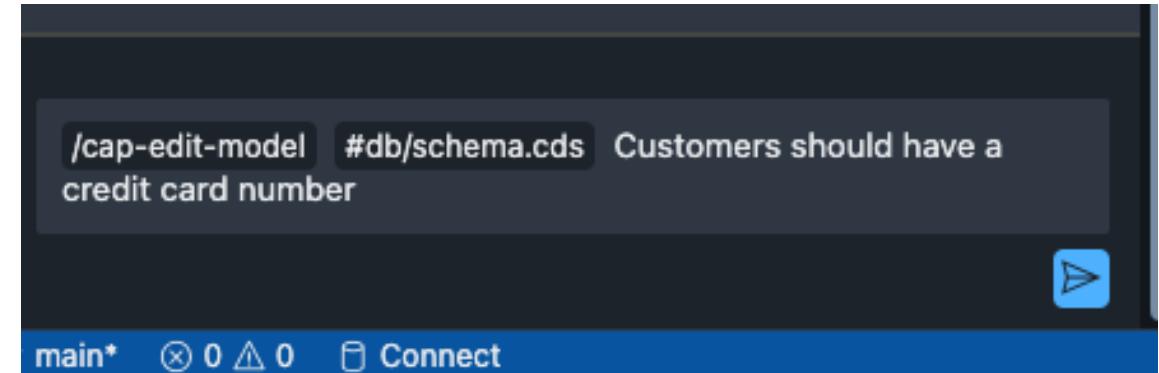
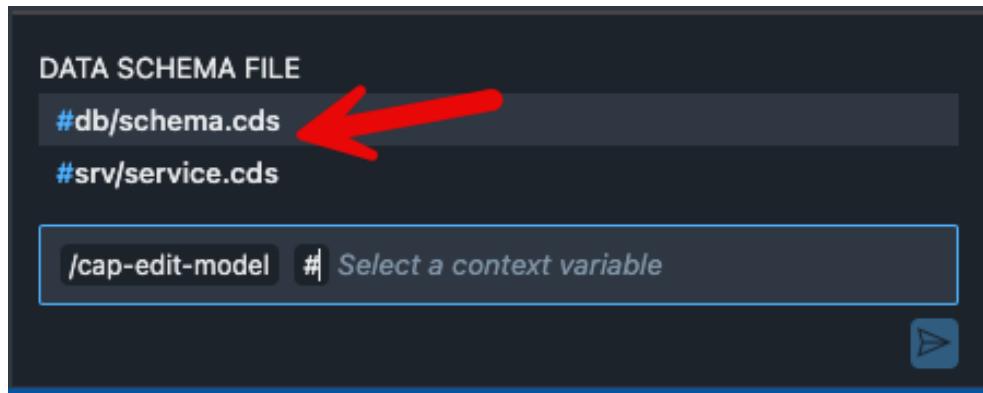
\$>cds watch (API & UI Preview)

The screenshot shows the SAP Application Development Project Preview interface. At the top, it displays the SAP logo and the text "Application Development Project Preview". Below this, the project name "mybcproject01" and version "1.0.0" are shown. The main content area is titled "Services (1)" and lists "mybcservice01Service". A red arrow points to the "Incidents" table entry. Below the table names are icons for viewing details and metadata.

The screenshot shows the Fiori preview for the "Incidents" table. The title bar includes the SAP logo, the page title "Preview – List of mybcservice01Service.Incidents", a search bar, and filter buttons. The table header is "Incidents (6)". The columns are: Title, Urgency, Status, Created At, Created By, and Modified At. The data rows are:

| Title                  | Urgency | Status      | Created At                | Created By | Modified At               |
|------------------------|---------|-------------|---------------------------|------------|---------------------------|
| Password Reset Request | Low     | closed      | Jun 28, 2021, 12:05:00 AM | Charlie    | Jun 28, 2021, 12:10:00 AM |
| Shipping Delay         | Medium  | in progress | Jun 28, 2021, 12:15:00 AM | Alice      | Jun 28, 2021, 12:15:00 AM |
| Payment Failure        | High    | new         | Jun 28, 2021, 12:10:00 AM | David      | Jun 28, 2021, 12:10:00 AM |
| Order Not Delivered    | High    | new         | Jun 27, 2021, 11:52:23 PM | Alice      | Jun 27, 2021, 11:52:23 PM |
| Account Access Issue   | Medium  | in progress | Jun 28, 2021, 12:00:00 AM | Bob        | Jun 28, 2021, 12:00:00 AM |
| Network down...        | High    | new         | Nov 22, 2024, 11:28:41 AM | privileged | Nov 22, 2024, 11:29:51 AM |

## CAP Modeling 수정("/cap-edit-model #db/schema.cds" + description)



Customers should have a credit card number

## **Step #2 : CAP Plugins 기능 적용**

Attachments, Change logging, Audit logging...

# CAP Plugins 기능 확인(Attachment handling)

## CAP Plugins

<https://cap.cloud.sap/docs/plugins/#attachments>

```
>>>schema.cds
using { Attachments } from '@cap-js/attachments';

entity Incidents {
    ...
    attachments: Composition of many Attachments;
}

>>>run npm add
$>npm add @cap-js/attachments
```

The screenshot shows the sidebar of the capire documentation website. The sidebar includes links for Getting Started, Cookbook, CDS, Node, Java, Tools, and a 'Plugins' section. Under 'Plugins', there is a list of various services: OData v2 Proxy, UI5 Dev Server, GraphQL Adapter, **Attachments** (with a red arrow pointing to it), SAP Document Management, Audit Logging, Change Tracking, Notifications, Telemetry, Open Resource Discovery, CAP Operator for K8s, and SAP Event Broker. Below these are 'Releases' and 'Resources' sections.

Get Started ▾ Guides ▾ CDS ▾ Node ▾ Java ▾ Tools ▾ Plugins ▾

## Attachments

The Attachments plugin provides out-of-the-box handling of attachments stored in, for example, AWS S3 through [SAP BTP's Object Store service](#). To use it, simply add a composition of the predefined aspect `Attachments` like so:

```
using { Attachments } from '@cap-js/attachments';
entity Incidents { ...
    attachments: Composition of many Attachments
}
```

That's all we need to automatically add an interactive list of attachments to your Fiori UIs as shown below.

The screenshot shows a Fiori UI detail page for an incident titled "Solar panel broken". The page has tabs for Overview, Conversation, and Attachments. The Attachments tab is active, displaying a message: "No documents available When there are, you'll see them here." The Conversation tab shows a single message from "Sunny Sunshine" dated "Sep 4, 2022, 5:30:00PM" stating "Please check why the solar panel is broken". The General Information section shows the title "Solar panel broken", customer "Sunny Sunshine", status "In Process", and urgency "High".

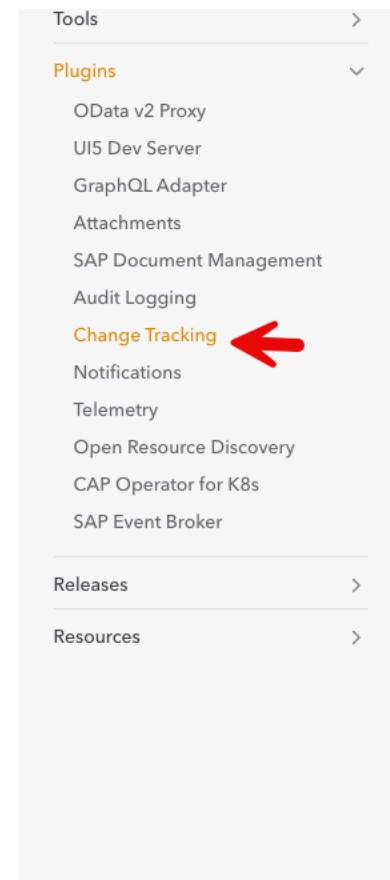
# CAP Plugins 기능 확인 (Change Tracking)

## CAP Plugins

<https://cap.cloud.sap/docs/plugins/#change-tracking>

```
>>>service.cds
annotate my.Incidents {
    customer @changelog: [customer.firstName];
    title   @changelog;
    status   @changelog;
}

>>>run npm add
$>npm add @cap-js/change-tracking
```



## Change Tracking

The Change Tracking plugin provides out-of-the box support for automated capturing, storing, and viewing of the change records of modeled entities. All we need is to add @changelog annotations to your models to indicate which entities and elements should be change-tracked.

```
annotate my.Incidents {
    customer @changelog: [customer.name];
    title   @changelog;
    status   @changelog;
}
```

| Change History |                          |       |               |                                      |           |  |  |  |
|----------------|--------------------------|-------|---------------|--------------------------------------|-----------|--|--|--|
| Change Type    | On                       | By    | Object Type   | Object ID                            | Field     | New Value  | Old Value                                  |  |
| Update         | Oct 17, 2023, 6:25:02 PM | alice | Conversations | Sunny Sunshine, 2022-09-04T12:00:00Z | Message   | please check why the solar panel is still broken | please check why the solar panel is broken |  |
| Update         | Oct 17, 2023, 6:24:55 PM | alice | Incidents     | Incidents                            | Customers | Daniel Watts                                     | Sunny Sunshine                             |  |
| Update         | Oct 17, 2023, 6:24:49 PM | alice | Incidents     | Incidents                            | Title     | Solar panel still broken                         | Solar panel broken                         |  |

Available for:



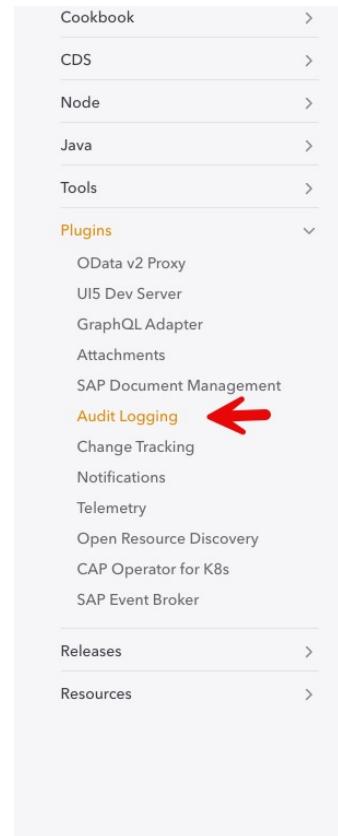
# CAP Plugins 기능 확인 (Audit Logging)

## CAP Plugins

<https://cap.cloud.sap/docs/plugins/#audit-logging>

```
>>>service.cds
annotate my.Customers with @PersonalData : {
    DataSubjectRole : 'Customer',
    EntitySemantics : 'DataSubject'
} {
    ID      @PersonalData.FieldSemantics: 'DataSubjectID';
    firstName @PersonalData.IsPotentiallyPersonal;
    lastName @PersonalData.IsPotentiallyPersonal;
    email    @PersonalData.IsPotentiallyPersonal;
    creditCardNumber @PersonalData.IsPotentiallySensitive;
};

>>>run npm add
$npm add @cap-js/audit-logging
```



## Audit Logging

The new Audit Log plugin provides out-of-the box support for logging personal data-related operations with the [SAP Audit Log Service](#). All we need is annotations of respective entities and fields like that:

```
annotate my.Customers with @PersonalData : {
    DataSubjectRole : 'Customer',
    EntitySemantics : 'DataSubject'
} {
    ID      @PersonalData.FieldSemantics: 'DataSubjectID';
    name   @PersonalData.IsPotentiallyPersonal;
    email  @PersonalData.IsPotentiallyPersonal;
    creditCardNo @PersonalData.IsPotentiallySensitive;
}
```

### Features:

- Simple, Annotation-based usage → automatically logging personal data-related events
- CAP Services-based programmatic client API → simple, backend-agnostic
- Logging to console in development → fast turnarounds, minimized costs
- Logging to [SAP Audit Log Service](#) in production
- Transactional Outbox → maximised scalability and resilience

### Available for:



```
[audit-log] - PersonalDataModified: {
  data_subject: {
    id: { ID: '0d0bb7da-9a86-44de-88e4-d0a6c879d311' },
    role: 'Customer',
    type: 'demouser01Srv.Customers'
  },
  object: {
    type: 'demouser01Srv.Customers',
    id: { ID: '0d0bb7da-9a86-44de-88e4-d0a6c879d311' }
  },
  attributes: [ { name: 'email', old: 'email9140', new: 'email9140222' } ],
  uuid: '2cc019eb-811c-403b-8864-ebd50751da71',
  tenant: undefined,
  user: 'privileged',
  time: 2024-10-17T07:35:32.388Z
}
```

# Attachment Plug-in

The screenshot shows the SAP Studio interface with the following details:

- EXPLORER** sidebar: Shows the project structure under **MYBCPROJECT01**, including **schema.cds**.
- EDITOR**:
  - Storyboard - mybcproject01**: Shows CDS code defining entities **Incidents** and **Conversations**. The **Attachments** plugin is used for both.
  - schema.cds**: Shows the CDS schema definition. Red arrows point to:
    - (1) The command `npm add @cap-js/attachments` in the terminal output.
    - (2) The import statement `using attachments from '@cap-js/attachments';` in the storyboard code.
    - (3) The `attachments: Composition of many Attachments;` field in the storyboard code.
- TERMINAL**: Shows the output of the npm command, indicating 117 packages added and 856 audited packages.

Attachments 사용 선언

Attachments 컬럼 추가. “Composition of many Attachments” Attachment기능과 연계

Npm library 추가 설치 : `@cap-js/attachments`

# Change-tracking plug-in

The screenshot shows the SAP Cloud Platform Studio interface with the project 'mybcproject01' open. The Explorer sidebar on the left lists files and folders, including '.vscode', 'app', 'assets', 'annotations.cds', 'index.html', 'launchpadPage.html', 'db', 'src', 'schema.cds', 'undeploy.json', 'env', 'node\_modules', and 'srv'. In the center, the code editor displays 'service.cds' with the following content:

```
1  using { mybcproject01 as my } from '../db/schema.cds';
2
3  @path: '/service/mybcservice01'
4  @requires: 'authenticated-user'
5  service mybcservice01Service {
6      @odata.draft.enabled
7      entity Incidents as projection on my.Incidents;
8      @odata.draft.enabled
9      entity Customers as projection on my.Customers;
10
11     annotate my.Incidents {
12         customer @changelog: [customer.firstName];
13         title @changelog;
14         status @changelog;
15     }
16 }
```

A red arrow labeled '(2)' points to the 'service.cds' file in the Explorer. A green box highlights the annotation code starting at line 11, and a red arrow labeled '(3)' points to it. At the bottom of the terminal window, another red arrow labeled '(1)' points to the command used to install the npm library.

```
user: mybcproject01 $ npm add @cap-js/change-tracking
```

Change log 대상 컬럼 지정

Npm library 추가 설치 : @cap-js/change-tracking

# Audit-logging plug-in

The screenshot shows the VS Code interface with the following details:

- EXPLORER:** Shows the project structure under `MYBCPROJECT01`, including `.vscode`, `app`, `assets`, `annotations.cds`, `db`, `schema.cds`, `undeploy.json`, `env`, `node_modules`, and `srv`. A red arrow points to the `service.cds` file in the list.
- EDITOR:** The `service.cds` file is open, showing CDS code. A green box highlights the following code block:

```
annotate my.Customers with @PersonalData : {
    DataSubjectRole : 'Customer',
    EntitySemantics : 'DataSubject'
} {
    ID      @PersonalData.FieldSemantics: 'DataSubjectID';
    firstName @PersonalData.IsPotentiallyPersonal;
    lastName @PersonalData.IsPotentiallyPersonal;
    email   @PersonalData.IsPotentiallyPersonal;
    creditCardNumber @PersonalData.IsPotentiallySensitive;
}
```

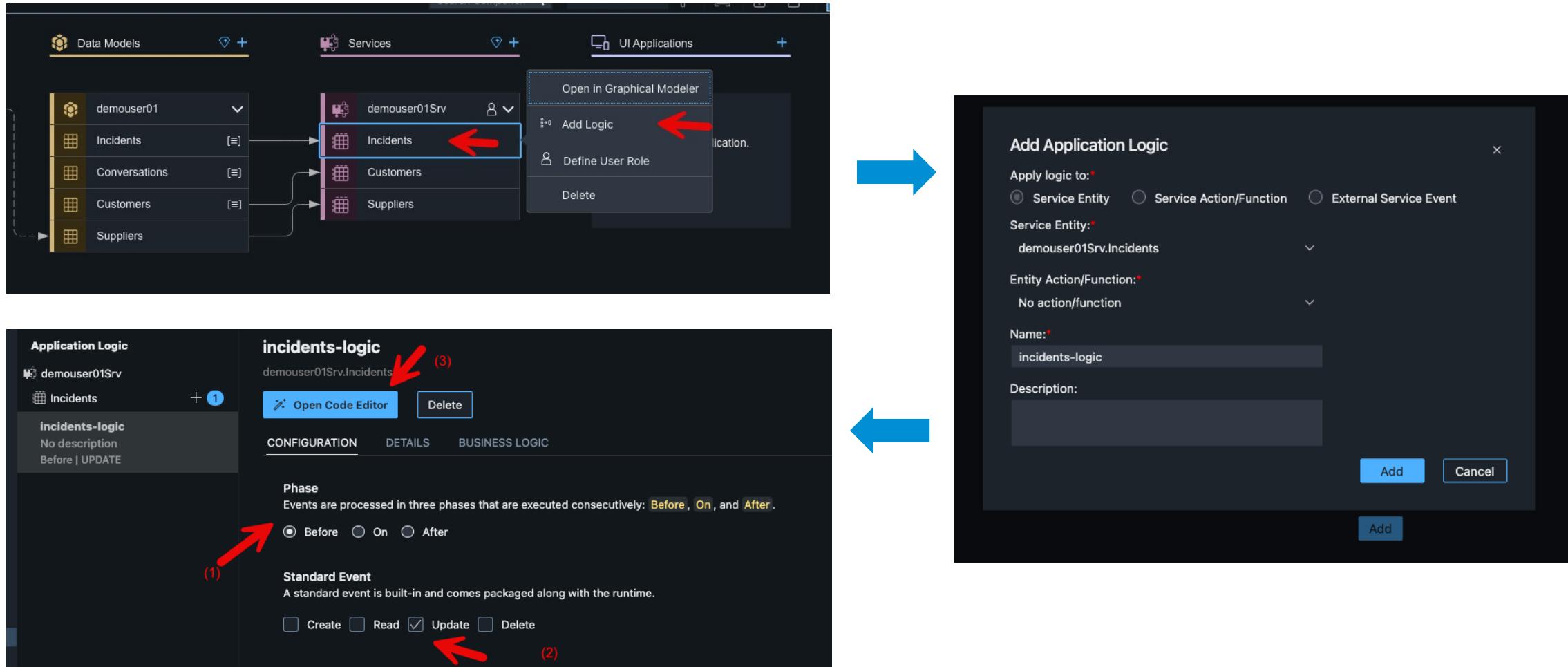
A red arrow points to the `annotate` keyword.
- TERMINAL:** The terminal shows the command `npm add @cap-js/audit-logging` being run, with npm warning messages about node version compatibility. A red arrow points to the command.

Audit 대상 컬럼 지정과 audit type 지정

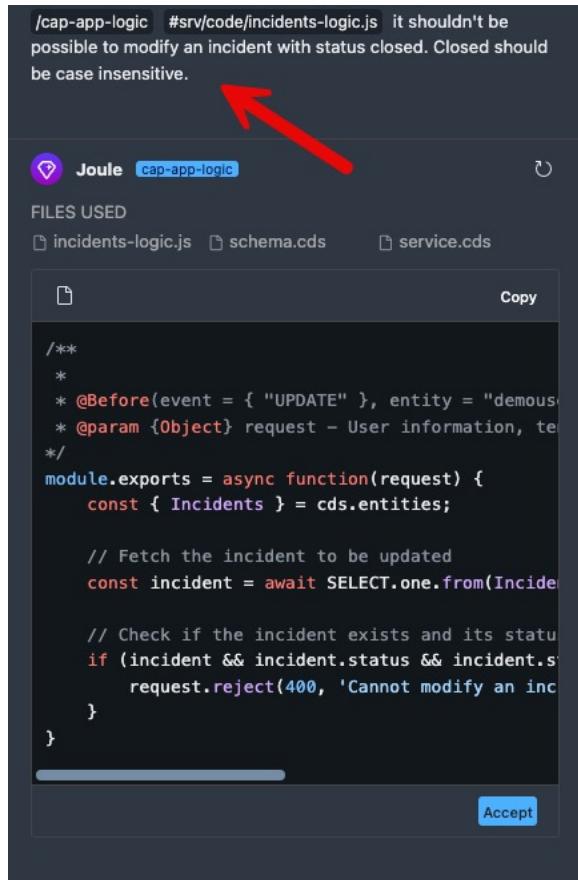
Npm library 추가 설치 : `@cap-js/audit-logging`

## **Step #3 : Adding Custom logic to CAP model**

# Adding Custom business logic



# Adding Custom business logic("/cap-app-logic #srv/code/incidents-logic.js" + description)



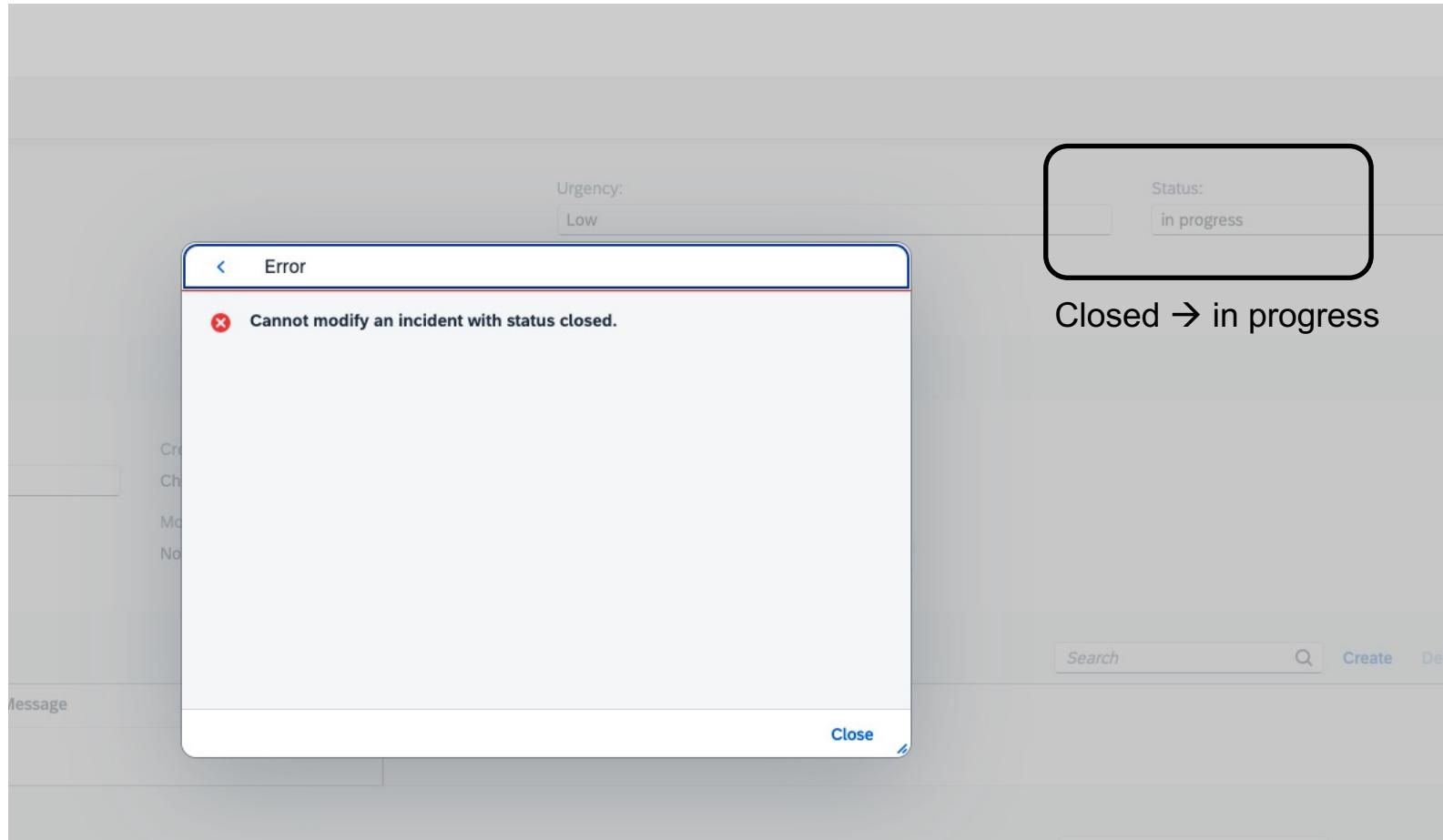
The SAP Storyboard interface shows the Application Logic Editor with the file "incidents-logic.js" open. The code is identical to the one in the Joule screenshot. A red arrow points to the message card above the code editor:

/cap-app-logic #srv/code/incidents-logic.js it shouldn't be possible to modify an incident with status closed. Closed should be case insensitive.

Below the code editor is an "Accept" button.

/cap-app-logic #srv/code/incidents-logic.js  
it shouldn't be possible to modify an incident with  
status closed. Closed should be case insensitive.

# Adding custom logic



**Step #4 : Adding UI application(Work Zone 구성)**

# Create UI5 Project

<https://8xsghdn-bw0zhxp.us10cf.applicationstudio.cloud.sap/index.html>

New Project From Template

Select Template and Target Location

subscribed (multi-tenant) SAP Mobile Development Kit application.

More Information

More



**SAP Fiori generator**

Create an SAPUI5 application using SAP Fiori elements or a freestyle approach

More Information



Template Selection

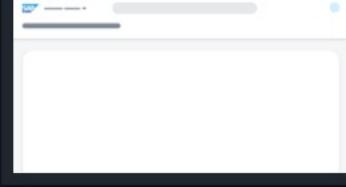
Choose your application template.

Which template do you want to use? \*

**Basic**

Create a freestyle application, starting with an empty page.

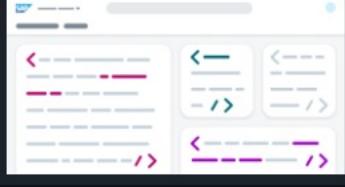
More Information



**Custom Page**

Create an SAP Fiori elements application containing a custom page based on the flexible programming model.

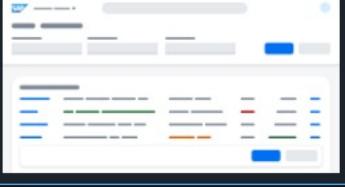
More Information



**List Report Page**

Create an SAP Fiori elements application containing a list report and an object page.

More Information



# Create UI5 Project

The image displays three sequential screenshots of the SAP Fiori generator's 'Project From Template' interface, illustrating the steps to create a UI5 project.

**Screenshot 1: Data Source and Service Selection**

This step is titled 'Data Source and Service Selection'. It shows the configuration of a data source and service. The 'Data source' is set to 'Connect to a System', 'System' is 'incident\_api\_dest', and 'Service Path' is '/service/incidentapp07'. The sidebar on the left lists 'Select Template and Target Location', 'Template Selection' (selected), 'Data Source and Service Selection' (selected), 'Entity Selection', and 'Project Attributes'.

**Screenshot 2: Entity Selection**

This step is titled 'Entity Selection'. It shows the configuration of the selected service. The 'Main entity' is 'Incidents' and 'Navigation entity' is 'None'. The 'Table type' is 'Responsive'. The sidebar on the left lists 'Select Template and Target Location', 'Template Selection' (selected), 'Data Source and Service Selection' (selected), 'Entity Selection' (selected), and 'Project Attributes'.

**Screenshot 3: Deployment Configuration**

This step is titled 'Deployment Configuration'. It shows the configuration of deployment settings. The 'Target' is set to 'Cloud Foundry', and the 'Destination name' is 'incident\_api\_dest - https://btp-kr-pockr-dev-incidentapp07-srv.cfapp...'. The 'Table type' is 'Responsive'. The sidebar on the left lists 'Select Template and Target Location', 'Template Selection' (selected), 'Data Source and Service Selection' (selected), 'Entity Selection' (selected), and 'Project Attributes'.

# Create UI5 Project

SAP Fiori generator ⓘ

● [Select Template and Target Location](#)  
SAP Fiori generator

● [Template Selection](#)  
Template: List Report Page

● [Data Source and Service Selection](#)  
Data Source: Connect to a System  
System: incident\_api\_dest  
Service Path: /service/incidentapp07

● [Entity Selection](#)  
Main Entity: Incidents  
Navigation Entity: None  
Generate Annotations: Yes  
Table Type: Responsive

○ [Project Attributes](#)  
Module Name: fioriapp\_incident07  
Application Title: fioriapp\_incident07  
Application Namespace:  
Description: fiori app for incident 07  
[More...](#)

○ Deployment Configuration

○ Fiori Launchpad Configuration

Project Attributes  
Configure the main project attributes.

Module name ⓘ \*  
fioriapp\_incident07

Application title ⓘ  
fioriapp\_incident07

Application namespace ⓘ  
[empty]

Description ⓘ  
fiori app for incident 07]

Project folder path \*  
/home/user/projects

Minimum SAPUI5 version ⓘ \*  
1.130.2

Add deployment configuration  
 Yes  No

Add FLP configuration  
 Yes  No

Configure advanced options ⓘ  
 Yes  No

< Back [Next >](#) ⓘ The generat

SAP Fiori generator ⓘ

● [Select Template and Target Location](#)  
SAP Fiori generator

● [Template Selection](#)  
Template: List Report Page

● [Data Source and Service Selection](#)  
Data Source: Connect to a System  
System: incident\_api\_dest  
Service Path: /service/incidentapp07

● [Entity Selection](#)  
Main Entity: Incidents  
Navigation Entity: None

Fiori Launchpad Configuration  
Configure Fiori Launchpad settings

Semantic Object \*  
incidentapp07

Action \*  
manage

Title \*  
Manage Incidents

Subtitle (optional)  
[empty]

SAP BTP Cockpit

BTPKRMTA / WZDemo

## Subaccount: WZDemo - HTML5 Applications

Add Application Auto Refresh:

2 Configuration issues. Show More Information

All: 115

Search All Business Solutions

Managed Application Router provided by SAP Build Work Zone, standard editor

| Application Name                 | Active Version | Business Solution                | Actions |
|----------------------------------|----------------|----------------------------------|---------|
| comsapformsformsexample          | 0.0.1          | comsapformsformsexample          |         |
| comsaptestfiorielementtemplate23 | 0.0.1          | comsaptestfiorielementtemplate23 |         |
| fioritest15fioritest151          | 0.0.1          | fioritest15fioritest151          |         |
| comsttsapfioritest18             | 0.0.1          | comsttsapfioritest18             |         |
| comsapdemofiorix14               | 0.0.1          | comsapdemofiorix14               |         |
| comsttsapfioritest12             | 0.0.1          | comsttsapfioritest12             |         |
| comsapdemofioriistn0             | 0.0.1          | comsapdemofioriistn0             |         |
| comsttsapfioritest17             | 0.0.1          | comsttsapfioritest17             |         |
| comsttsapfioritest20             | 0.0.1          | comsttsapfioritest20             |         |
| comsapdemofiorix8                | 0.0.1          | comsapdemofiorix8                |         |

A large red arrow points from the top right towards the table, specifically highlighting the first row.

BTP Cockpit

Destination Certificates BTP Cockpit

Overview Services Service Marketplace Instances and Subscriptions (5) HTML5 Applications Connectivity Destinations Destination Certificates Destination Trust Cloud Connectors Security Users Role Collections Roles Trust Configuration Settings Entitlements Usage Analytics Legal Information

BTPKRMTA / BTPKRMTA-Dev\_buildcode\_hanson

## Subaccount: BTPKRMTA-Dev\_buildcode\_hanson - Instances and Subscriptions

All: 7

Some instances in this subaccount are not shown because you don't have permission to view them. See [Scopes and Permissions](#)

Service: Plan: Status:

Search All All All

Subscriptions (5) Instances (1) Environments (1)

Applications to which your subaccount is currently subscribed

| Application                                  | Plan       | Changed On  | Changed By           | Status     | Actions |
|--|------------|-------------|----------------------|------------|---------|
| SAP Build Code                               | standard   | 7 Oct 2024  | jungwoo.han@sap.c... | Subscribed | ...     |
| Continuous Integration & Delivery            | build-code | 7 Oct 2024  | jungwoo.han@sap.c... | Subscribed | ...     |
| Feature Flags Service                        | dashboard  | 25 Nov 2024 | APPLICATION_OWNER... | Subscribed | ...     |
| SAP Business Application Studio              | build-code | 7 Oct 2024  | jungwoo.han@sap.c... | Subscribed | ...     |
| <b>SAP Build Work Zone, standard edition</b> | foundation | 13 Nov 2024 | APPLICATION_OWNER... | Subscribed | ...     |

Instances (1)

Service instances created in: Cloud Foundry | Kyma/Kubernetes | Other environments

Create

사이트 관리자 - 채널 관리자

+ 신규 ▾

| 제목 및 내역   | ID             | 대상/소스 <small>i</small> | 최종 수정일/버전                | 상태                          | 액션 |
|---|----------------|------------------------|--------------------------|-----------------------------|----|
| HTML5 Apps <small>i</small><br>Subdomain: wzaripa | saas_approuter | 소스: HTML5 앱 저장소        | 2024년 11월 20일 오전 9:07:55 | 업데이트됨<br><small>리포트</small> |    |

빠른 링크 >

**동기화**

- 사이트 디렉토리
- 컨텐트 관리자
- 채널 관리자
- 설정

## 컨텐트 관리자

제목, 내역, ID에서 검색



모든 항목

선택 항목 표시

지우기

## Role Mapping

모든 항목 (6)

생성

컨텐트 탐색기

임포트

엑스포트

| <input type="checkbox"/> | 유형 | 제목                      | 내역                         | ID                                   | 채널         | 최종 수정      |
|--------------------------|----|-------------------------|----------------------------|--------------------------------------|------------|------------|
| <input type="checkbox"/> |    | WZ_STD_TEST             |                            | WZ_STD_TEST                          | 로컬         | 21/08/2024 |
| <input type="checkbox"/> |    | WorkzoneGrpStd          |                            | 901cee62-6ac8-457b-83e6-7930b1393740 | 로컬         | 21/08/2024 |
| <input type="checkbox"/> |    | Fiori Application PWC 0 | A Fiori application PWC 0. | com.sap.demo.fioripwc0               | HTML5 Apps | 21/08/2024 |
| <input type="checkbox"/> |    | UI5 Document            |                            | bd952361-ae9a-4318-b200-f6c95bf3d070 | 로컬         | 19/08/2024 |
| <input type="checkbox"/> |    | Everyone                |                            | baccount_everyone                    | 로컬         | 12/08/2024 |
| <input type="checkbox"/> |    | New Experience          |                            | 2d019929-8e8f-41ec-b36f-3ada20d9336d | 로컬         | 05/03/2024 |

항목 (1-6)

&lt; &gt;

## Group Mapping

빠른 링크



사이트 관리자 - 컨텐트 관리자

컨텐트 관리자 / WZ\_STD\_TEST

제목: \* WZ\_STD\_TEST

ID: i WZ\_STD\_TEST

내역: 내역을 입력하십시오.

저장 취소

액 공간 번역 추가 정보

모든 앱 (2)

제목 내역 ID 채널 최종 수정 지정 상태

| 유형   | 제목                  | 내역                                  | ID         | 채널         | 최종 수정                               | 지정 상태 |
|--|---------------------|-------------------------------------|------------|------------|-------------------------------------|-------|
| <input type="checkbox"/> Fiori Application | A Fiori application | com.sap.demo.fiori                  | HTML5 Apps | 21/08/2024 | <input checked="" type="checkbox"/> |       |
| <input type="checkbox"/> UI5 Document      |                     | bd952361-ae9a-4318-b200-f6c95bf3... | 로컬         | 19/08/2024 | <input type="checkbox"/>            |       |

항목 (1-2) < >

빠른 링크 >

**Group Mapping도 동일한 방법으로 활성화**

- Overview
- Services
  - Service Marketplace
  - Instances and Subscriptions
- Cloud Foundry >
- HTML5 Applications
- Connectivity >
  - Destinations
  - Destination Certificates
  - Destination Trust
  - Cloud Connectors
- Security >
  - Users
  - Role Collections
  - Roles
  - Trust Configuration
  - Settings
- Entitlements
- Usage Analytics

Subaccount: WZDemo - Role C...

Create

- Workflow\_Admin
- Workflow\_End\_User
- Workzone\_Admin
- Workzone\_Advanced\_Theming
- Workzone\_Area\_Admin
- Workzone\_End\_User
- Workzone\_External\_User
- Workzone\_XSUAA\_Access
- WZ\_STD\_TEST**

## WZ\_STD\_TEST Role - User Mapping

Description: WZ\_STD\_TEST

Roles    Users (1)    User Groups (1)    Attribute Mappings

| Role Name | Role Template | Application Identifier |
|-----------|---------------|------------------------|
| No Roles  |               |                        |

### Users (1)

| ID      | Identity Provider | E-Mail             | First Name | Last Name |
|---------|-------------------|--------------------|------------|-----------|
| P000020 | IAS               | dhmun326@gmail.com | DoHyun     | Moon      |

### User Groups (1)

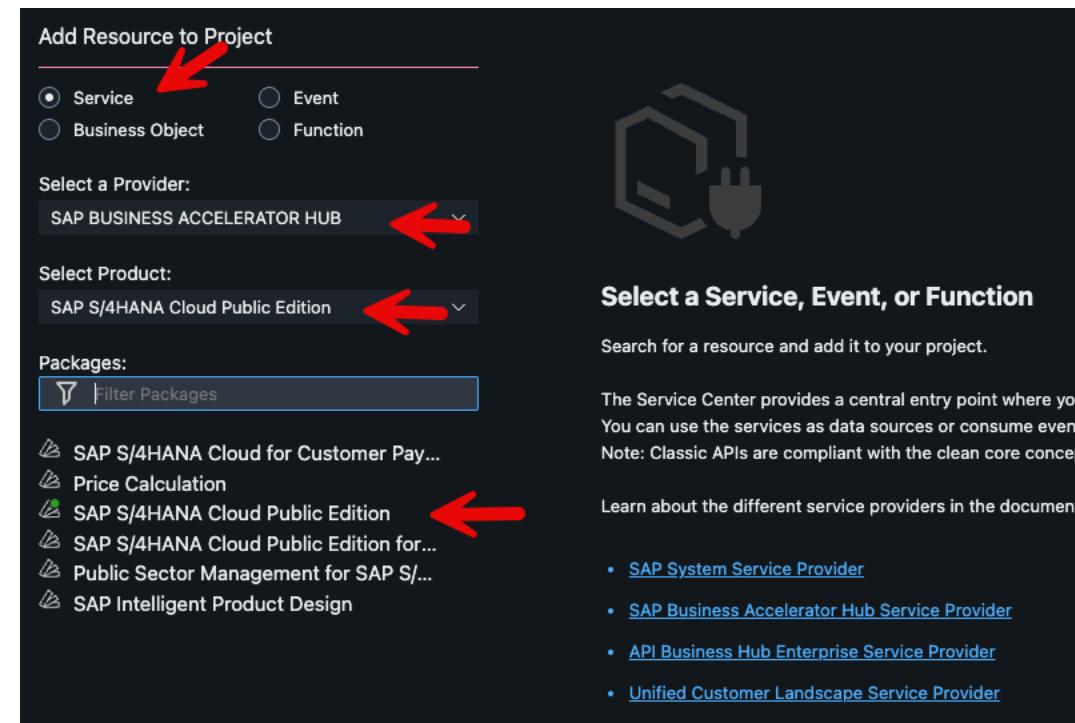
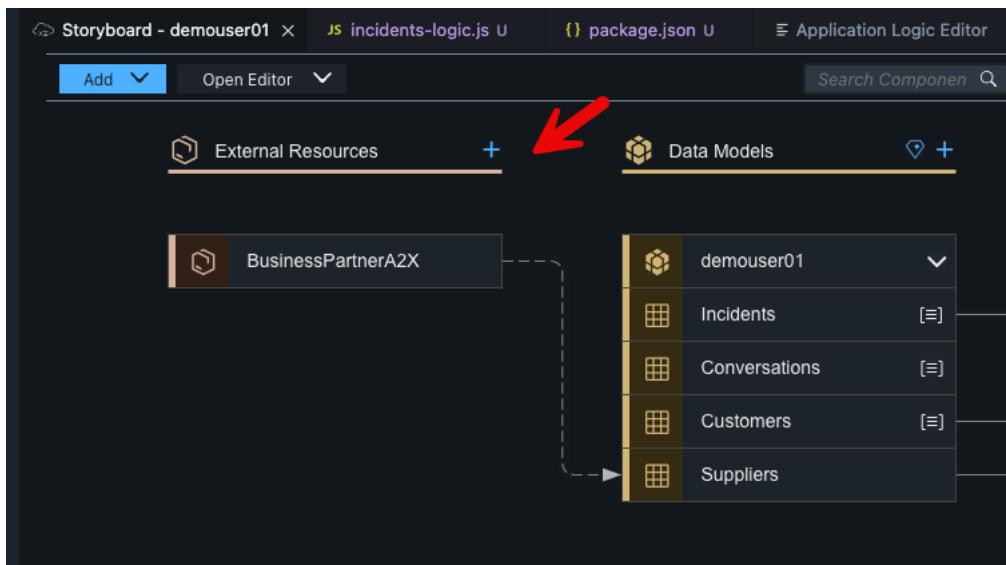
| Identity Provider | Name      |
|-------------------|-----------|
| IAS               | MSADGroup |

### Attribute Mappings

**Optional : Consume SAP Application API**  
**- mash-up CAP local entity & remote entity**



# Consume S/4HANA Service(API)



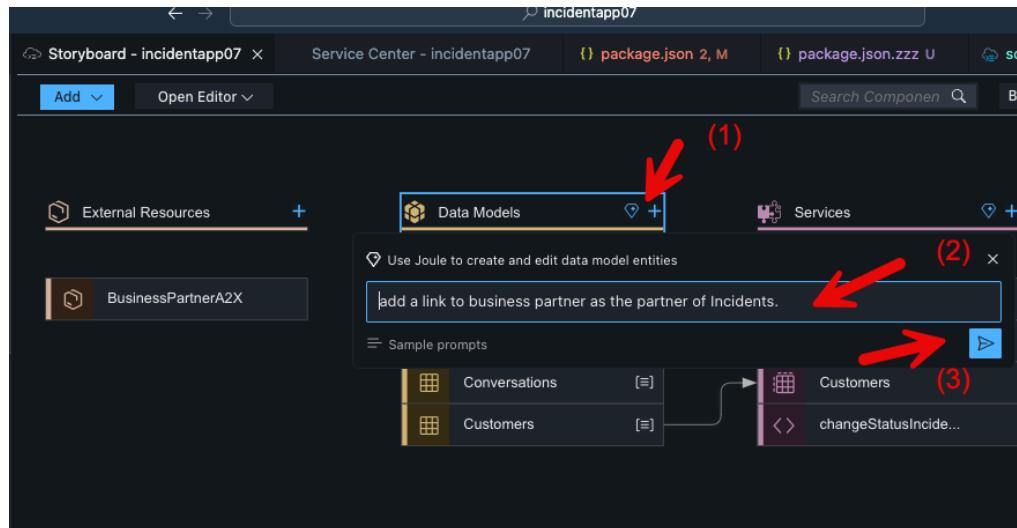
→ SAP Id로 login 필요

# Consume S/4HANA Service(API)

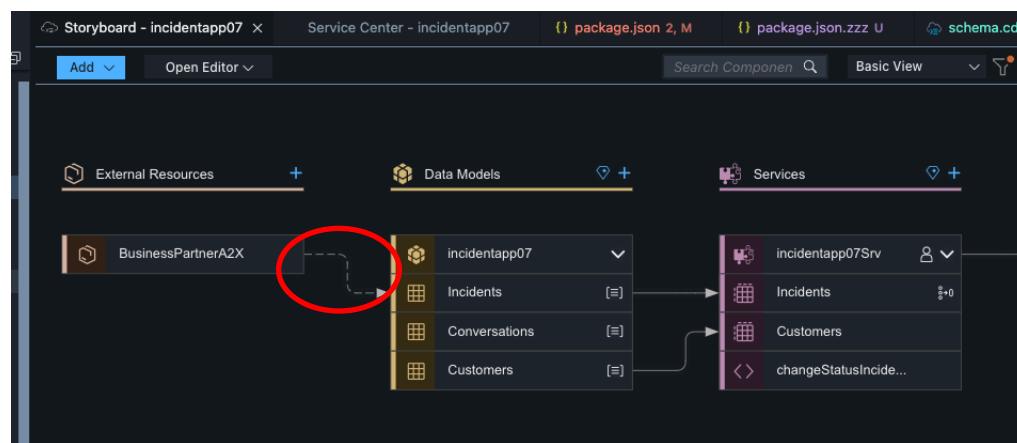
The screenshot shows the SAP S/4HANA Cloud Public Edition interface. The top navigation bar includes tabs for Storyboard - demouser01, Service Center - demouser01, service.cds U, schema.cds U, service.cds U, package.json 1, U, and a menu icon. The main content area displays the SAP S/4HANA Cloud Public Edition > SAP S/4HANA Cloud Public Edition > Business Partner (A2X) page. The title is "Business Partner (A2X)" with the subtitle "SAP S/4HANA Cloud Public Edition". Below the title, it says "Create, read, update or delete the master data for business partner, supplier or customer using this synchronous inbound service". On the left, there's a sidebar titled "Add Resource to Project" with a breadcrumb "SAP S/4HANA Cloud Public Edition". Under "Services:", "business" is selected. A list of services is shown, with "Business Partner (A2X)" highlighted by a red arrow. To the right, the "Business Partner (A2X)" details page is displayed with tabs for "ENTITIES" and "PROPERTIES". The "ENTITIES" tab is active, showing a table of properties:

| Filter Entities               | ENTITY DETAILS                 | LIVE DATA | View Diagram |
|-------------------------------|--------------------------------|-----------|--------------|
| A_AddressEmailAddress         | Property Name                  | Kind      |              |
| A_AddressFaxNumber            | AddressID                      | key       |              |
| A_AddressHomePageURL          | Person                         | key       |              |
| A_AddressPhoneNumber          | OrdinalNumber                  | key       |              |
| A_BPAddrDepntIntlLocNumber    | IsDefaultEmailAddress          |           |              |
| A_BPAddressIndependentEmail   | EmailAddress                   |           |              |
| A_BPAddressIndependentFax     | SearchEmailAddress             |           |              |
| A_BPAddressIndependentMobile  | AddressCommunicationRemarkText |           |              |
| A_BPAddressIndependentPhone   |                                |           |              |
| A_BPAddressIndependentWebsite |                                |           |              |

# Mashup CAP local entity with remote entity



Script : add a link to business partner as the partner of incidents



JOULE

You

/cap-edit-model #db/schema.cds add a link to business partner as the partner of Incidents.

Joule cap-edit-model

FILES USED

schema.cds service.cds BusinessPartnerA2X.cds

Copy

```
using { BusinessPartnerA2X } from '../srv/external/BusinessPartnerA2X.cds';

namespace incidentapp07;
using { uid, managed } from '@sap/cds/common';

@assert.unique: { title: [title] }
entity Incidents : uid, managed {
  title: String(100) @mandatory;
  urgency: String(20);
  status: String(20);
  customerEmail: String(100);
  conversations: Composition of many Conversations on conversations.incident =
  customer: Association to Customers;
  partner: Association to BusinessPartnerA2X.A_BusinessPartner;

}

entity Conversations : uid {
  timestamp: DateTime;
  author : String(100);
  message: String(500);
  incident: Association to Incidents;
}

@assert.unique: { email: [email] }
entity Customers : uid {
  firstName: String(50);
```

Click "Accept"

# Consume S/4HANA Service(API)

The screenshot shows the SAP Cloud Platform Studio interface. The left sidebar displays the project structure under 'DEMOUSER01'. The right pane shows the 'ts-logic.js' file with code for defining entities like Incidents, Conversations, Customers, and Suppliers. A green box highlights the 'entity Suppliers' definition at the bottom of the code.

```
1 //using { BusinessPartnerA2X as bupa } from './external/BusinessPartnerA2X.cds';
2 using { demouser01 as my } from '../db/schema.cds';
3
4 @path: '/service/demouser01'
5 @requires: 'authenticated-user'
6 service demouser01Srv {
7   @odata.draft.enabled
8   entity Incidents as projection on my.Incidents;
9   @odata.draft.enabled
10  entity Customers as projection on my.Customers;
11
12  Add to Chat (Ctrl+L) | Edit highlighted code (Ctrl+I).
13  @readonly
14  entity Suppliers as projection on my.Suppliers;
15
16 }
17
18 entity Conversations : cuid {
19   timestamp: DateTime;
20   author: String(100);
21   message: String(500);
22   incident: Association to Incidents;
23 }
24
25 @assert.unique { email: [email] }
26 entity Customers : cuid {
27   firstName: String(50);
28   lastName: String(50);
29   name : String(100) = (firstName || ' ' || lastName);
30   phoneNumber: String(15);
31   email: String(100) @mandatory;
32   creditCardNumber: String(16);
33   incidents: Association to many Incidents on incidents.customer = $self;
34 }
35
36 entity Suppliers as projection on bupa.A_BusinessPartner {
37   key BusinessPartner as ID,
38   BusinessPartnerFullName as fullName,
39   BusinessPartnerIsBlocked as isBlocked
40 }
41
```

>>>schema.cds

```
entity BusinessPartners as projection on BusinessPartnerA2X.A_BusinessPartner {
key BusinessPartner,
BusinessPartnerFullName,
BusinessPartnerIsBlocked
}
```

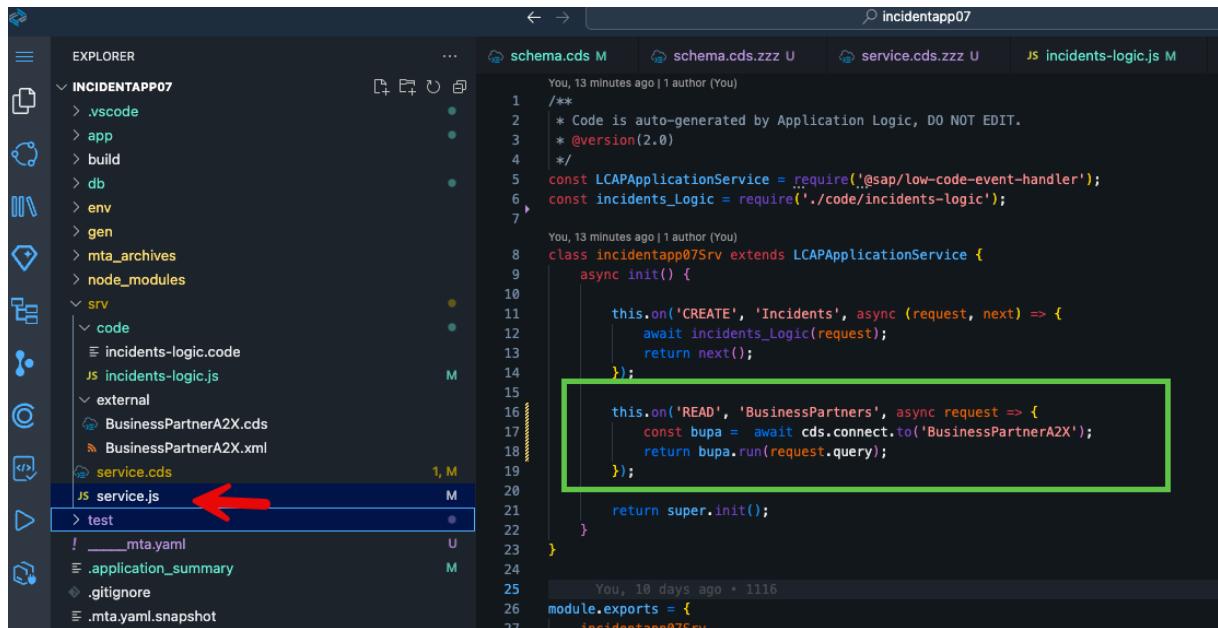
The screenshot shows the 'service.cds' file in the Application Logic Editor. It defines a service 'demouser01Srv' with a projection for 'Incidents' and another for 'Customers'. It also includes a projection for 'Suppliers' using the '@readonly' annotation. A green box highlights the '@readonly' annotation and the 'entity Suppliers' definition.

```
1 //using { BusinessPartnerA2X as bupa } from './external/BusinessPartnerA2X.cds';
2 using { demouser01 as my } from '../db/schema.cds';
3
4 @path: '/service/demouser01'
5 @requires: 'authenticated-user'
6 service demouser01Srv {
7   @odata.draft.enabled
8   entity Incidents as projection on my.Incidents;
9   @odata.draft.enabled
10  entity Customers as projection on my.Customers;
11
12  Add to Chat (Ctrl+L) | Edit highlighted code (Ctrl+I).
13  @readonly
14  entity Suppliers as projection on my.Suppliers;
15
16 }
```

>>>service.cds

```
@readonly
entity BusinessPartners as projection on my.BusinessPartners;
```

# Consume S/4HANA Service(API)



```
/* Code is auto-generated by Application Logic, DO NOT EDIT.
 * @version(2.0)
 */
const LCAPApplicationService = require('@sap/low-code-event-handler');
const incidents_Logic = require('./code/incidents-logic');

class incidentapp07Srv extends LCAPApplicationService {
    async init() {
        this.on('CREATE', 'Incidents', async (request, next) => {
            await incidents_Logic(request);
            return next();
        });

        this.on('READ', 'BusinessPartners', async request => {
            const bupa = await cds.connect.to('BusinessPartnerA2X');
            return bupa.run(request.query);
        });
    }

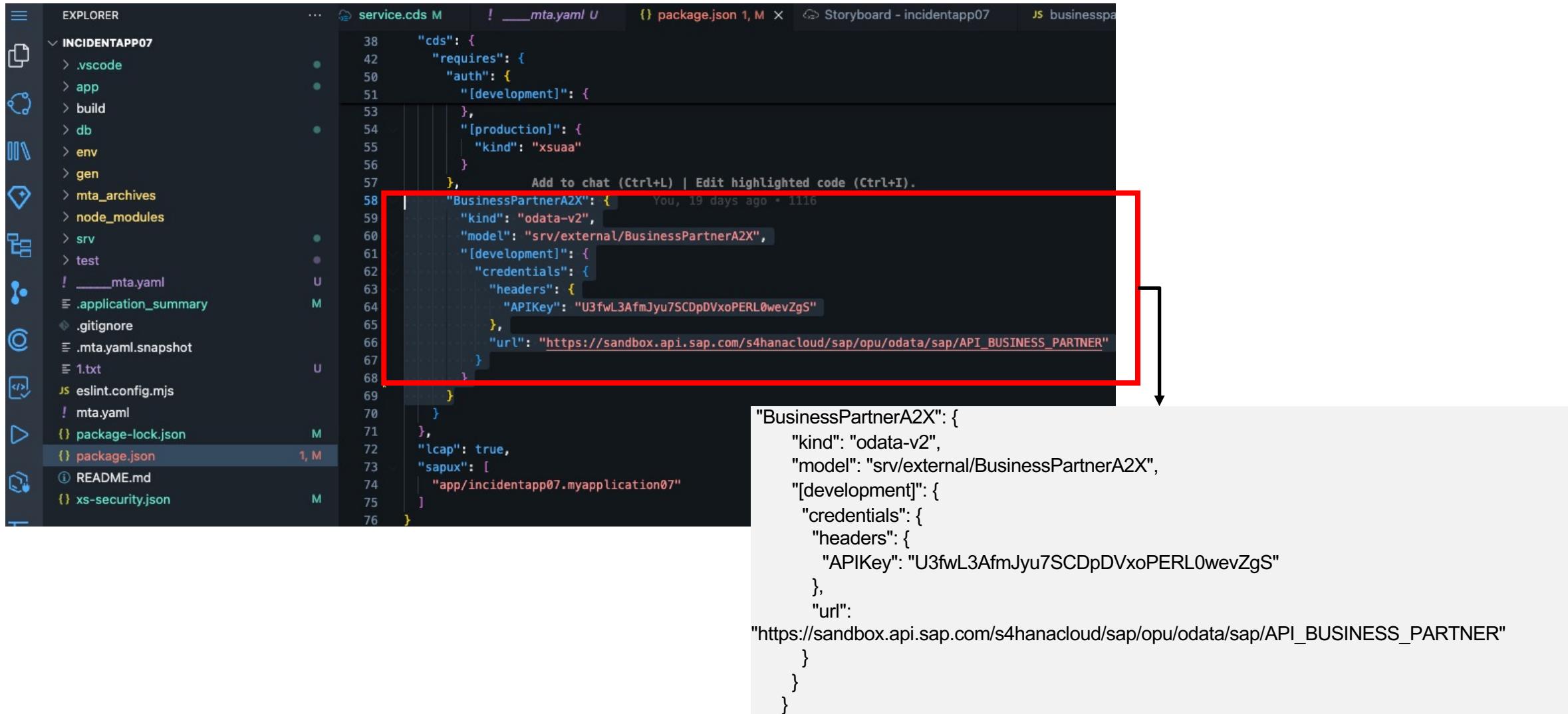
    return super.init();
}

module.exports = {
    incidentapp07Srv
};
```

>>>service.js

```
this.on('READ', 'BusinessPartners', async request => {
const bupa = await cds.connect.to('BusinessPartnerA2X');
return bupa.run(request.query);
});
```

# Consume S/4HANA Service(API)



The screenshot shows a Visual Studio Code (VS Code) interface with the following details:

- EXPLORER** sidebar on the left.
- service.cds** is the active file in the editor.
- Content of service.cds:**

```
38     "cds": {  
39         "requires": {  
40             "auth": {  
41                 "[development]": {  
42                     },  
43                     "[production]": {  
44                         "kind": "xsuaa"  
45                     }  
46                 },  
47                 Add to chat (Ctrl+L) | Edit highlighted code (Ctrl+I).  
48             "BusinessPartnerA2X": {  
49                 "kind": "odata-v2",  
50                 "model": "srv/external/BusinessPartnerA2X",  
51                 "[development)": {  
52                     "credentials": {  
53                         "headers": {  
54                             "APIKey": "U3fwL3AfmJyu7SCDpDVxoPERL0wevZgS"  
55                         },  
56                         "url": "https://sandbox.api.sap.com/s4hanacloud/sap/opu/odata/sap/API_BUSINESS_PARTNER"  
57                     }  
58                 }  
59             }  
60         }  
61     }  
62     }  
63     }  
64     }  
65     }  
66     }  
67     }  
68     }  
69     }  
70     }  
71     }  
72     "lcap": true,  
73     "sapux": [  
74         "app/incidentapp07.myapplication07"  
75     ]  
76 }
```

- A red box highlights the "BusinessPartnerA2X" configuration block.
- A tooltip window displays the JSON code for "BusinessPartnerA2X".
- Bottom right corner text:** "INTERNAL – SAP and Partners Only" and "49".

# Consume S/4HANA Service(API)

Welcome to @sap/cds Server

Serving incidentapp07 1.0.0

These are the paths currently served:

Web Applications:

- /incidentapp07.myapplication07/dist
- /incidentapp07.myapplication07/webapp

Service Endpoints:

| /service/incidentapp07 / \$metadata   |               |
|---|---------------|
| Incidents   | Fiori preview |
| Customers   | Fiori preview |
| <b>BusinessPartners</b>  | Fiori preview |

pretty print 적용

```
[{"@odata.context": "$metadata#BusinessPartners", "@odata.nextLink": "BusinessPartners?%24skiptoken=1000", "value": [{"BusinessPartner": "11", "BusinessPartnerFullName": "Cust15 Cust15", "BusinessPartnerIsBlocked": false}, {"BusinessPartner": "202", "BusinessPartnerFullName": "Nue tech inc", "BusinessPartnerIsBlocked": false}, {"BusinessPartner": "203", "BusinessPartnerFullName": "Expo technologies Plc", "BusinessPartnerIsBlocked": false}, {"BusinessPartner": "1018", "BusinessPartnerFullName": "Bechtle AG Kriek street", "BusinessPartnerIsBlocked": false}, {"BusinessPartner": "1710", "BusinessPartnerFullName": "Inlandeskunde DE 80", "BusinessPartnerIsBlocked": false}, {"BusinessPartner": "123456", "BusinessPartnerFullName": "PEPPOL-XYZ", "BusinessPartnerIsBlocked": false}]}]
```

# CAP Annotation

# **Thank you.**